UNITED STATES PATENT AND TRADEMARK OFFICE

NOTICE OF ALLOWANCE AND FEE(S) DUE

22850   7590   12/16/2008

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER
SINGH, DALZID E

ART UNIT	PAPER NUMBER
2613	

DATE MAILED: 12/16/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,431	12/28/2005	Manabu Yoshino	283713US40PCT	3912

TITLE OF INVENTION: OPTICAL COMMUNICATION SYSTEM USING OPTICAL FREQUENCY CODE, OPTICAL TRANSMISSION DEVICE AND OPTICAL RECEPTION DEVICE THEREOF, AND REFLECTION TYPE OPTICAL COMMUNICATION DEVICE

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	03/16/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u>

Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or <u>Fax</u> **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)

_____ (Signature)

_____ (Date)

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10/562,431	12/28/2005	Manabu Yoshino	283713US40PCT	3912

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nonprovisional	NO	$1510	$300	$0	$1810	03/16/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
SINGH, DALZID E	2613	398-077000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE   (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

☐ A check is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____   Date _____

Typed or printed name _____   Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.   OMB 0651-0033   U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

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Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 657 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 657 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

	Application No.	Applicant(s)
Notice of Allowability	10/562,431	YOSHINO ET AL.
	Examiner	Art Unit	
	Dalzid Singh	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *28 December 2005*.

2. ☒ The allowed claim(s) is/are *1-39 which have been renumbered as 1-39 respectively*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☒ All   b) ☐ Some*   c) ☐ None   of the:

        1. ☒ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of
        Paper No./Mail Date _____.

    Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☒ Information Disclosure Statements (PTO/SB/08),
    Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application

6. ☐ Interview Summary (PTO-413),
    Paper No./Mail Date _____ .

7. ☐ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____.

/Dalzid Singh/
Primary Examiner, Art Unit 2613

DETAILED ACTION

Allowable Subject Matter

1.   Claims 1-39 are allowed.

2.   The following is an examiner's statement of reasons for allowance:

Claim 1 is allowed because the prior arts of record do not disclose of teach an

optical communications system using optical codes, characterized by: an optical

transmitter which:

transmits, for each piece of data of a binary data sequence, an optical code

signal whose optical intensity-frequency characteristic is at least one of a function $C_i(f)$

and a complementary function $(1-C_i(f))$ of the i-th code corresponding to the value of

said each piece of data of the binary data sequence, at least over an optical frequency

width FSR;

said function $C_i(f)$ is a periodic function with an optical frequency f as a variable,

expressed as $C_i(f)=C_i(f+FSR_i)$;

the optical frequency width FSR is an optical frequency width which is a common

multiple of a repetition period FSR_i of a function forming each code in an optical

frequency range from a predetermined optical frequency Fst to a predetermined optical

frequency Fla;

the complementary function of the function $C_i(f)$ is a function obtained by

subtracting the function $C_i(f)$ from 1;

the function Ci(f) and the complementary function (1-Ci(f)) bear the following

relation:

$\int$Ci(f)Ci(f)df > $\int$Ci(f)(1-Ci(f))df where $\int$df is a definite integral with respect to f

for an arbitrary interval FSR in the optical frequency range from Fst to Fla; and

the function Ci(f), a function Cj(f) of an arbitrary j-th code other than the i-th

code and the complementary function (1-Cj(f)) of the function Cj(f) bear the following

relation:

$\int$Ci(f)Cj(f)df = $\int$Ci(f)(1-Cj(f))df; and

an optical receiver which includes: generates from said received optical signal

corresponding to the difference between a first intensity signal corresponding to the

optical intensity of an optical signal whose optical intensity-frequency characteristic is

Ci(f) based on the function Ci(f) and a second intensity signal corresponding to the

optical intensity of an optical signal whose optical intensity-frequency characteristic is

(1-Ci(f)) based on the complementary function (1-Ci(f)); and regenerates said data

sequence from said first difference signal.

Claim 10 is allowed because the prior arts of record do not disclose of teach an

optical transmitter, which:

receives a binary data sequence and an optical signal; and

generates by and transmits from said encoder an optical code signal whose

optical intensity-frequency characteristic is at least one of said functions Ci(f) and (1-

Ci(f)) of said i-th code corresponding to the value of each piece of data of said i-th

binary data sequence at least in the optical frequency width FSR; wherein:

said function Ci(f) is a periodic function with an optical frequency f as a variable,

expressed as Ci(f)=Ci(f+FSRi);

an optical frequency width is the optical frequency width FSR which is a common

multiple of a repetition period FSRi of a function forming each code in said optical

frequency range from the predetermined optical frequency Fst to the predetermined

optical frequency Fla;

the complementary function (1-Ci(f) of the function Ci(f) is a function obtained

by subtracting said function Ci(f) from 1;

said functions Ci(f) and (1-Ci(f)) bear the following relation:

∫Ci(f)Ci(f)df> ∫Ci(f)(1-Ci(f))df where ∫df is a definite integral with respect to f

for an arbitrary interval corresponding to said optical frequency width FSR contained in

the optical frequency range from the optical frequency Fst to the optical frequency Fla;

said function Ci(f), a function Cj(f) of an arbitrary j-th code other than the i-th

code and a complementary function (1-Cj(f)) of said function Cj(f) bear the following

relation: ∫Ci(f)Cj(f)df= ∫Ci(f)(1-Cj(f))df.

Claim 22 is allowed because the prior arts of record do not disclose of teach an optical receiver characterized by:

filter means which permits the passage therethrough of an optical signal having an optical intensity-frequency characteristic based on a function;

intensity detecting means for detecting the optical intensity of said optical signal;

and means for adding together or subtracting the intensity signals from each other; and

which is supplied with the received optical signal and regenerates data corresponding to the difference between:

a first intensity signal corresponding to the optical intensity of an optical signal having an optical intensity-frequency characteristic $C_i(f)$ based on a frequency characteristic function $C_i(f)$; and

a second intensity signal corresponding to the optical intensity of an optical signal having an optical intensity-frequency characteristic $(1-C_i(f))$ based on the complementary frequency function $(1-C_i(f))$; wherein:

said function $C_i(f)$ is a periodic function expressed as $C_i(f)=C_i(f+FSR_i)$, the value of the function $C_i(f)$ being in the range of 0 to 1;

an optical frequency width FSR is an optical frequency width which is a common multiple of a repetition period FSR_i of a function forming each code in the optical frequency range from the predetermined optical frequency Fst to the predetermined optical frequency Fla;

said complementary function of the function Ci(f) is a function obtained by subtracting said function Ci(f) from 1;

said functions Ci(f) and (1-Ci(f)) bear the following relation:

$\int Ci(f)Ci(f)df> \int Ci(f)(1-Ci(f))df$ where $\int df$ is a definite integral with respect to f for an arbitrary interval FSR corresponding to said optical frequency width FSR contained in said optical frequency range from the optical frequency Fst to the optical frequency Fla; and

said function Ci(f), a function Cj(f) of an arbitrary j-th code Cj(f) other than said i-th code and the complementary function (1-Cj(f)) of said function Cj(f) bear the following relation: $\int Ci(f)Cj(f)df = \int Ci(f)(1-Cj(f))df$.

Claim 32 is allowed because the prior arts of record do not disclose of teach reflective optical communication equipment which is supplied with a received optical signal and a binary data sequence, modulates the received the optical signal to an optical signal whose optical intensity-frequency characteristic is a function with an optical frequency f as a variable, and transmits the modulated optical signal, and which characterized by:

an encoder which is supplied with said received optical signal of at least an optical frequency width FSR and outputs an optical signal by an optical filtering frequency characteristic of a first function Ci(f);

a complementary encoder which is supplied with said received optical signal and outputs a complementary optical signal filtered by a filtering optical frequency characteristic of a complementary function (1-Ci(f)); and

selective combining means which selectively combines, according to the value of each piece of data, the optical signal and the complementary optical signal and transmits them as an optical code signal;

wherein: said function Ci(f) is a periodic function expressed as Ci(f)=Ci(f+FSRi), the value of said function Ci(f) being in the range of 0 to 1;

said optical frequency width FSR is an optical frequency width which is a common multiple of a repetition period FSRi of a function forming each code in said optical frequency range from the predetermined optical frequency Fst to the predetermined optical frequency Fla;

the complementary function of said function Ci(f) is a function obtained by subtracting said function Ci(f) from 1;

said function Ci(f) and (1-Ci(f)) bear the following relation:

∫Ci(f)Ci(f)df> ∫Ci(f)(1-Ci(f))df where ∫df is a definite integral with respect to f for an arbitrary interval corresponding to said optical frequency width FSR in the optical frequency range from the optical frequency Fst to the optical frequency Fla; and

said function Ci(f), a function Cj(f) of an arbitrary j-th code other than said i-th code and the complementary function (1-Cj(f)) of said function Cj(f) bear the following relation: ∫Ci(f)Cj(f)df= ∫Ci(f)(1-Cj(f))df.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

3.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Alamouti et al (US Patent No. 6,560,209) is cited to show method for frequency division duplex communications.

Kahn et al (US Patent No. 6,592,274) is cited to show transmission and reception of duobinary multilevel pulse-amplitude-modulated optical signals using finite-state machine-based encoder.

Mogre et al (US Pub. No. 2004/0047433) is cited to show method and/or apparatus to efficiently transmit broadband service content using low density parity code based coded modulation.

Wada et al (US Patent No. 7,177,544) is cited to show photonic network packet routing method and packet router for photonic network.

4.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Dalzid Singh whose telephone number is (571) 272-

3029. The examiner can normally be reached on Mon-Fri 9am - 5pm.

        If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

        Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status

information for unpublished applications is available through Private PAIR only. For

more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business

Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO

Customer Service Representative or access to the automated information system, call

800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dalzid Singh/
Primary Examiner
Art Unit 2613